



Sustainable Preparedness & Response Systems

Targeting System Improvements Using Metrics & Models of Performance

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PHASYS

**Public Health Adaptive
System Studies**

A CDC Preparedness & Emergency Response Research Center

Purpose

***To generate criteria and metrics
for measuring the effectiveness and
efficiency of preparedness and emergency
response systems***

***with application for
evidence-based planning & investment
for the public health system***

To build sustainable preparedness & response systems -

**Target investments to increase
positive impact on outcomes**

Research for “all hazards”

PHASYS starts with infectious diseases

- Outbreaks provide data, experience, and involvement among many public health system nodes

PHASYS later extends to natural disasters, accidents, and terrorism with public health consequences

- Each hazard type has response systems similar to and distinct from the others

Assumptions for sustainable system performance in response to infectious disease outbreaks

1. Optimal outcome is **fewest cases**
2. Cases are fewest when time between **critical response actions** is shortest.
3. Critical response actions are most rapid when **system characteristics** are optimal.
4. Optimal system characteristics have **measurable indicators**.
5. High-impact indicators can be identified in **computer-generated models**.
6. Model-identified indicators can be tested and validated in **field observations**.

System characteristics supporting **critical actions** in outbreak response:

- **Clinical acuity** to diagnose
- **Laboratory capacity** to confirm
- **Information intake** for reporting
- **Case investigation capacity**
- **Authority** to mitigate exposure source
- **Communication** authority, expertise & competence
- **Management capacity** for treatment & prophylaxis

In a 25-year retrospective literature review of >100 outbreak reports, 10 time-specific **critical response actions** were observed:

Potter, Sweeney et al., *JPHMP* 13 (5), 2007.

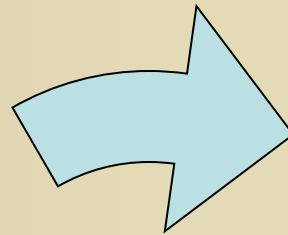
- Clinical observation
- Accurate diagnosis
- Laboratory confirmation *
- Exposure source identification
- Report to public health authority
- Risk-mitigation
- Population prophylaxis (if disease-appropriate)
- Public education
- Risk advice to healthcare workers
- last new case documentation

System characteristics & proposed indicators for outbreak response

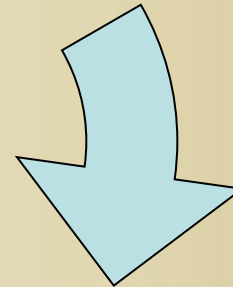
CHARACTERISTICS	INDICATORS, SUCH AS ...
Clinical	Time between observation & diagnosis
Laboratory	Time to confirm diagnosis
Info intake	Time to receive & act on clinical or lab report
Case investigation	Time to deploy field staff, create case definition, find cases
Authority	Time to mitigate exposure source (i.e., close restaurant; impose quarantine)
Communication	Time to communicate inter-agency and with media & public; effects of communication
Management	Time to deliver prophylaxis and/or treatment

Iterative approach to modeling, testing, and validation

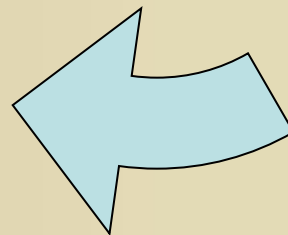
**Identify & Validate
Response Indicators
in Field Activity**



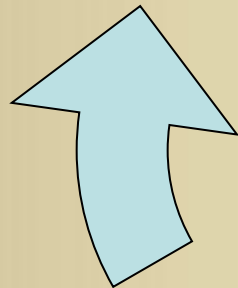
**Build Response Indicators
in PHS model**



**Challenge Model
with Outbreaks**



**Identify High-Impact
Response Indicators**



School Outbreak Movie

Limitations and caveats

- *Modeling requires practice expertise*
 - Field data
 - Professional participation & advice
- *Good models are simple, not perfect*
 - Refinement of system indicators occurs incrementally
- *Model results are not generalizable*
 - But do yield insights for field study, decision-making, and policy-making

Achieving sustainable response systems

“To improve something, we must be able to control it;
to control it, we must be able to understand it; and
to understand it we must be able to measure it.”

B.Turnock, *Public Health – What It Is & How It Works*

Contact PHASYS

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